19. Predict the point group of the following molecules

(a) NOCl,

(b) $[PtCl_4]^{2-}$

(c) CS_2

(d) CH_4

20. Construct a character table of C_{3v} point group.

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APRIL/MAY 2025

GCH23/DCH23 — PHYSICAL CHEMISTRY – II

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is meant by pulse method?

2. What is the first explosion limit?

3. Define mean ionic activity.

4. Write the importance of the salt bridge.

5. What is a membrane potential?

6. Define the Tafel equation.

7. What is an Abelian group? Provide an example.

8. What is a symmetry operation? Give an example related to molecular symmetry.

9. State the orthogonality theorem for irreducible representations.

10. According to symmetry, why can certain vibrations in a molecule be Raman active but not infrared active?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss the Rice Herzferd mechanism.

Or

(b) Elaborate on the reaction rate measurement using the stopped-flow method.

12. (a) Determine the activity coefficient of electrolytes.

Or

(b) Discuss the Debye-Huckel theory of strong electrolytes.

13. (a) Discuss the structure of the electric field interface of the Helmholtz-Perrin model.

Or

(b) Derive polarographic wave from half-wave potential.

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14. (a) Discuss the detailed procedure to identify the point group of a molecule.

Or

(b) Discuss the rule of the reducible representations.

15. (a) Explain the *Great Orthogonality* theorem.

Or

(b) Detect the symmetries of normal modes of vibration in NH_3.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the following.

(a) Chain reactions (3)

(b) Parallel reactions (3)

(c) Flash photolysis method. (4)

17. Derive Debye-Huckel limiting law and indicate its limitations.

18. Derive the Lippmann equation.